NAVIGATION SYSTEMS PROGRAM OFFICE PMW/PMA 156

(Re-Organizing to C4I&S-17X)

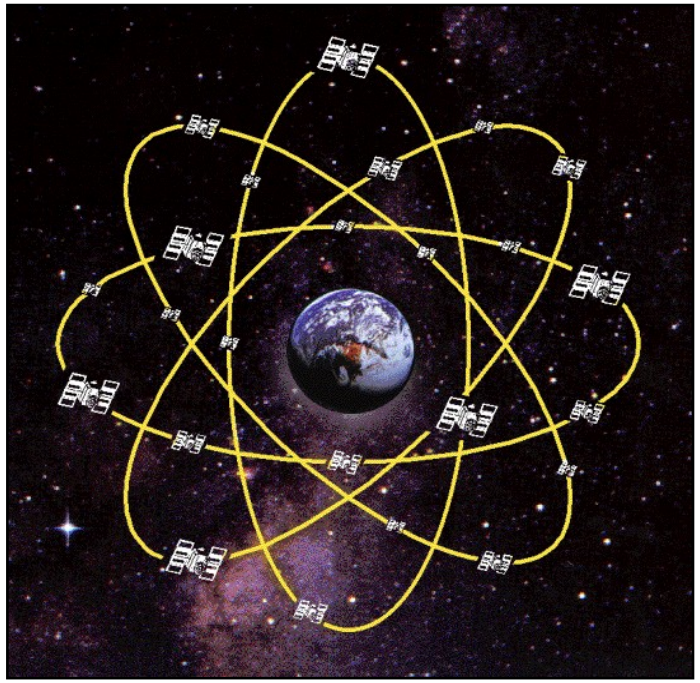
COMMON SYSTEMS ATRB

NAVIGATION SYSTEMS TECHNICAL REQUIREMENTS

01 September 2004

AGENDA

- PMW/A-17X RESPONSIBILITIES
- GPS MODERNIZATION
- GPS SATELLITE SIGNAL EVOLUTION
- TECHNOLOGY INSERTION
- PROTECTED NAVIGATION
- ANTI-JAM PROTECTION CAPABILITY
- NAVWAR REVIEW
- NAVY MUE REQUIREMENTS
- TIME & FREQUENCY SYNCHRONIZATION
- TECHNICAL AREAS OF INTEREST
- PMW/A-17X POINTS OF CONTACT



PMW/A-17X RESPONSIBILITIES

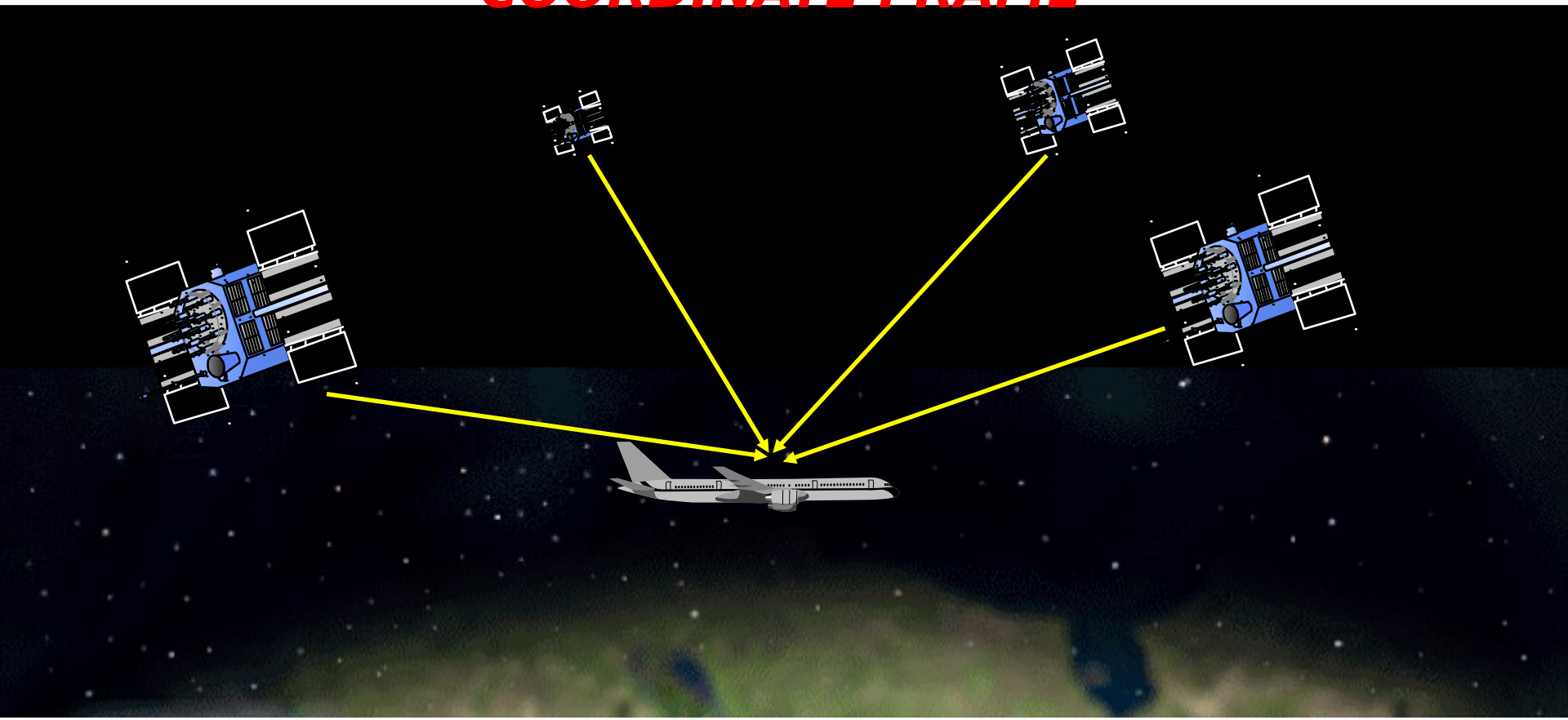
Navy's centralized GPS Program Office responsible for integration of GPS in all Navy Platforms.

PMW/A-17X is accountable to NAVAIR and SPAWAR for acquisition and sustainment management.

"Provide integrated GPS-based Navigation, Combat SR, and Space Surveillance capabilities to the Fleet"
CAPT Bob Lopez, PMW/A-156 (April 2004)

WHAT IS GPS ???

GPS PROVIDES PRECISE POSITION, VELOCITY, AND TIME IN A COMMON COORDINATE FRAME

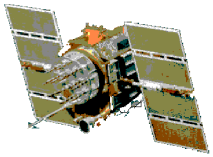


GPS MODERNIZATION

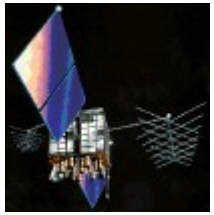
- **Upgrades all GPS segments**
  - Satellites
    - New signals transmitted from satellites
  - Control Segment
    - Upgrades control for new functions and better performance
  - User Equipment
    - Modernized User Equipment (MUE) to receive and process satellite signals – enables new capabilities
- **Improved robustness, accuracy, integrity**
- **Compatibility with prevention**

GPS SATELLITE SIGNAL EVOLUTION

GPS II / IIA / IIR
- Current System

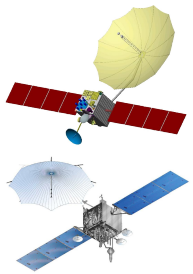


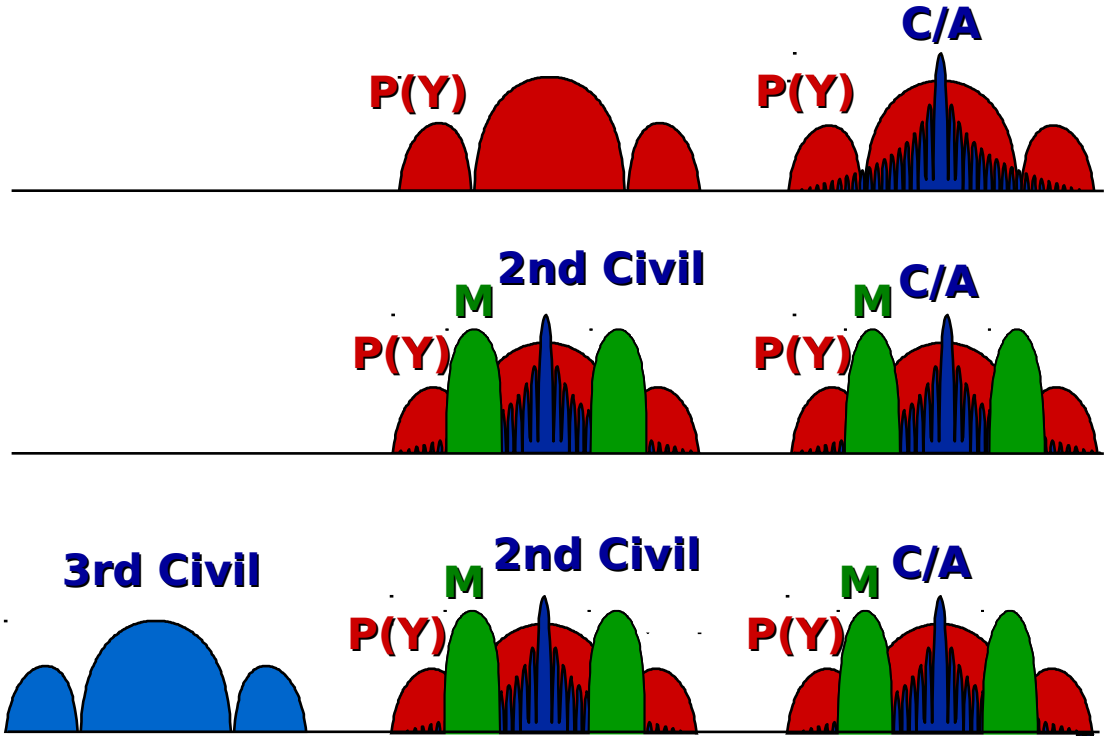
GPS IIR-M
- New Military Signal
- New Civil Signal
- Heritage GPS Arch
- Full Ops FY 08



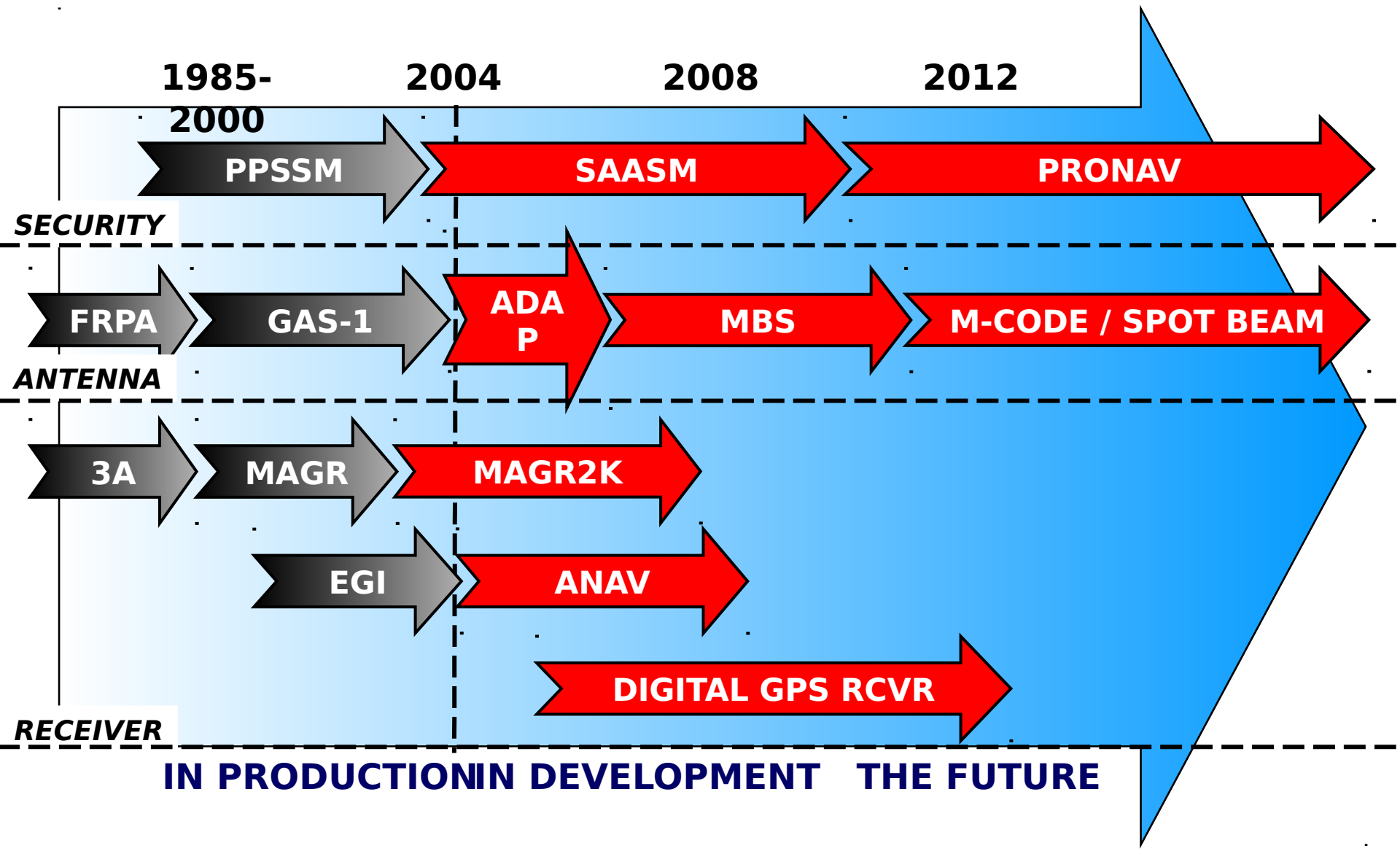
GPS IIF
- New Military Signal
- New Civil Signal
- New Safety of Life Signal
- Heritage GPS Arch
- Full Ops FY 12

GPS III
- All Previous Signals
- High Power Spot Beam
- New Arch to Address Full-Spectrum GPS Needs
- Full Ops FY 18





TECHNOLOGY INSERTION



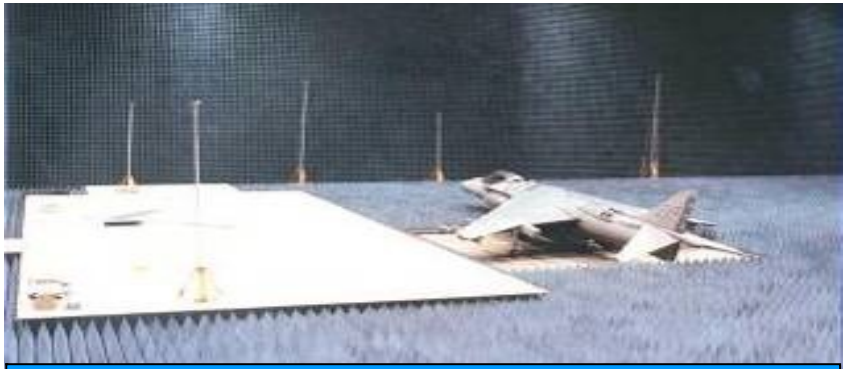
PROTECTED NAVIGATION

- **Move from COMSEC architecture to PROtected NAVigation (PRONAV) architecture** ***(30 July, 2002 ASD C3I John P. Stenbit Letter to Secretary of Air Force, DIRNSA, and Joint Staff)***
- **Shift protection paradigm from prevention of threat to deterrence, detection, and recovery from attacks**
- **No mandated GFE security architecture**
  - Allow manufacturers to design solutions to meet the requirements
  - No specific required anti-tamper method
  - No required central Key Loading and Initialization Facility (KLIF)
- **Simple and flexible key management architecture**
- **Demonstrate YMCA using the PRONAV Security Architecture**
  - Validated Specifications and Interface Control Documents for GB GRAM and GRAM SEM-E GPS receivers
  - GRAM SEM-E (MAGR2K) and GB-GRAM cards to validate specs and ICDs and to provide an initial industrial base
  - GPS Engine – HDL design files and software for the crypto processors, code generation engines, and key handling functions to generate YMCA

NAVWAR REVIEW

C-130
INTEGRATION COMPLETE

HH-60H
DT IN-PROCESS



AV8-B
ANTENNA CONTRACTED

F/A-18 E/F/G
TECHNICAL STUDY

NAVY MUE REQUIREMENTS

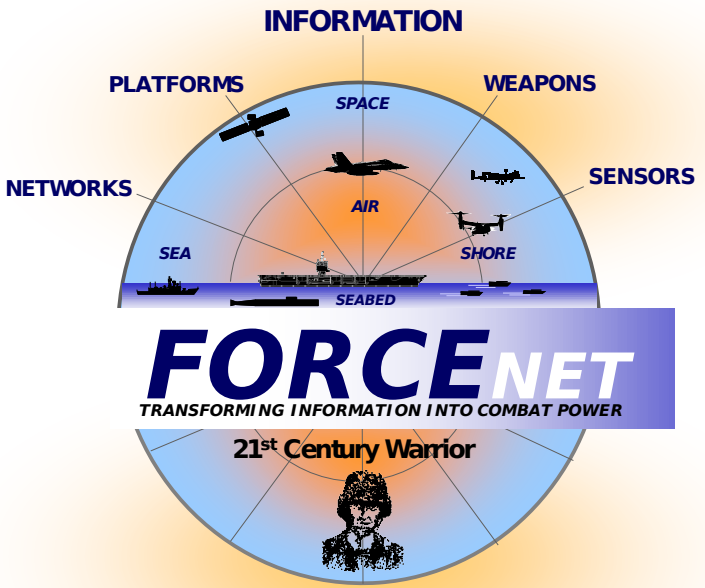
- **General Navigation Performance (backwards compatibility)**
  - New UE must work at least as well as legacy UE
- **Integration with aircraft systems (backwards compatibility)**
  - New UE must maintain legacy interfaces to ease UE integration
- **Emerging Requirements (Use GPS to do more)**
  a. National airspace compatibility
  b. International airspace compatibility
  c. Tactical special mission precision landings
  d. Carrier based landings
  e. General performance improvements
     i. Improved PNT accuracy
     ii. Increased jamming margin (and higher power satellites)
     iii. Operation in GPS denied environments (M-Code signal separation for prevention)
     iv. Flexible messaging and data rates
  f. Security architecture
  g. Engineering process for hardware and software development and certification
- **Support System Requirements**
  - MUE potentially forces changes to support systems (e.g. JMPS, TAMPS, etc…)

TIME & FREQUENCY SYNCHRONIZATION

- **GPS is the primary source for precise Time & Frequency data used for synchronization of Naval communications, C2, weapons systems, C4I, and networks.**

- **Many programs/systems require precise PNT**
  - Some programs are not aligned with each other

- **GPS based UE programs need to be aligned with each-other and JOINT DoD initiatives (e.g. FORCENet)**



TECHNICAL AREAS OF INTEREST

- COMSEC Architecture
- GPS Signal Protection
- Modernize User Equipment
- Obsolete UE Replacement
- Evolving Capabilities (e.g. JPALS, FORCENet, JTRS)
- Handheld/Special OPS UE
- Alternatives to GPS
- Time & Frequency Synchronization

PMW/A-17X POINTS OF CONTACT

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F/A-18 Carrier Landing Under “Dusty” Conditions